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LOADING AMERICAN GRAPES

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This Breakage Can Be Avoided

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF MARKETS
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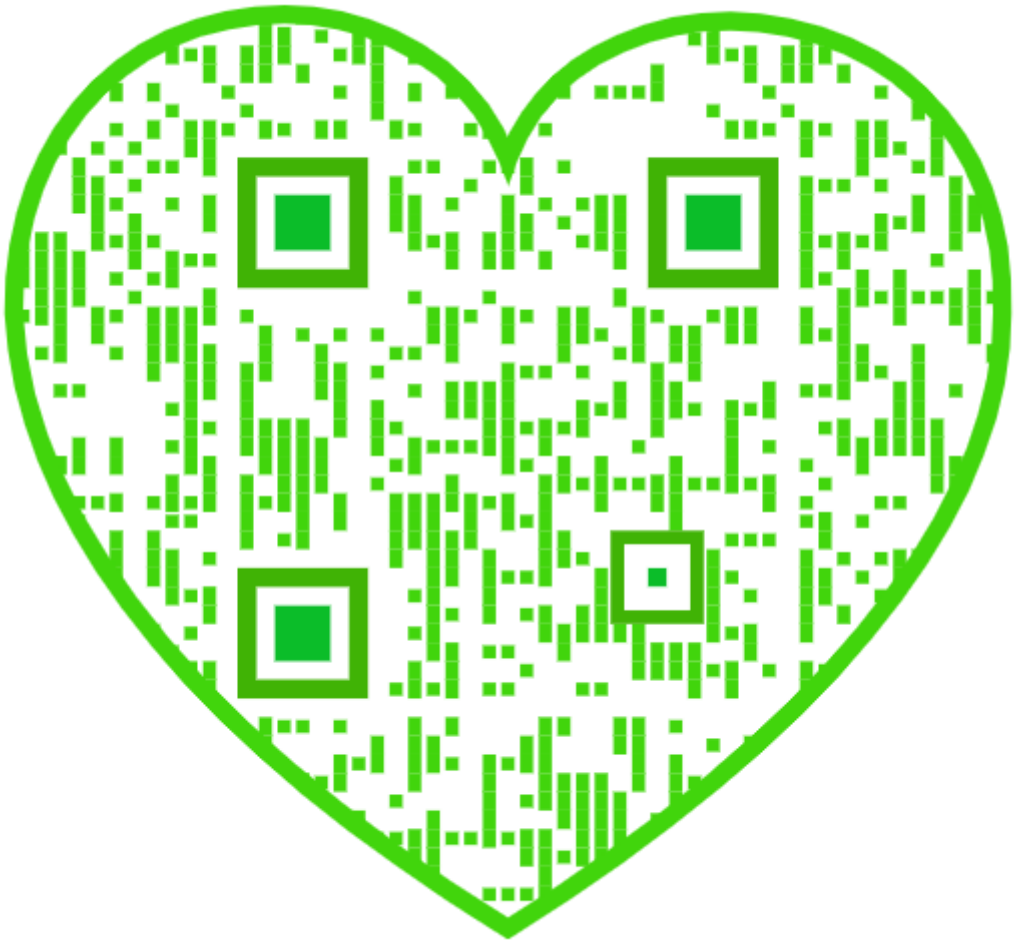


SUMMARY.

WHEN CLIMAX baskets are used for loading grapes they should be well made, of good wood, with veneer cut 17 to the inch as a minimum thickness for the 12-quart size and 20 to the inch for the 4 and 2 quart sizes. Wooden handles permit a firmer load than wire handles, as they strengthen the baskets and serve as braces in the load.

Load Climax baskets of the 12-quart size 7 high, 4-quart size 12 high, and 2-quart size 15 high. Load all other packages to a height of not less than 48 inches nor more than 60 inches from the bottom of the first layer.

Bushel baskets, hampers, and miscellaneous boxes are not satisfactory packages for grapes, for they can not be loaded safely with economy.

All types of grape packages carry best when loaded by the "straight system," i. e., with all packages end to end extending from one ice bunker to the other. In every other layer of Climax baskets it is necessary to load those that touch the bulkhead crosswise of the car in order to fill in the otherwise vacant spaces, but this should not be permitted anywhere else in the load.

All slack should be taken up as the packages are being loaded, using racks to fill out at the end of the car when there is surplus space.

Every fraction of an inch of surplus space from side to side of the car should be tightly filled in by loading the last row diagonally, as recommended in this bulletin.

The only place where any package should be placed crosswise of the car is at the ends of the load to fill in otherwise vacant places next to the ice bunkers.

LOADING AMERICAN GRAPES.

INVESTIGATIONS of the methods used in loading cars of grapes were conducted by the United States Department of Agriculture at Pennsylvania and New York grape-shipping points and in the markets of Boston, New York, Brooklyn, Philadelphia, and Pittsburgh during the shipping season of 1917. The findings presented in this document, however, apply equally to Pennsylvania, Michigan, New York, New Jersey, Ohio, and other American grape-shipping sections.

A close study of more than 300 cars while they were being loaded or unloaded showed that crushing caused greater losses in transit than fungus decay. The purpose of the investigation, therefore, was to determine the factors involved in the loading of grapes that influence crushing. These studies showed that the extent to which crushing will occur in a carload of grapes is governed by the type and strength of package, the manner and care used in loading, the height of the load, the construction of the car, and the handling it receives from the railroad.

PACKAGE.

The particular package to be used for shipping grapes is chosen because of the protection it gives to the fruit, its cost, its suitability for certain markets, its market attractiveness, and its availability. The 12-quart Climax baskets and trays were found by most shippers to give the greatest general satisfaction. Fancy table grapes were shipped usually in 2 and 4 quart Climax baskets, and these packages were satisfactory when properly made. As the 12-quart Climax baskets were the frailest in comparison with the weight contained, it was found that special care should be taken in their construction. If they were newly made of good, straight-grained wood, with the veneer cut not thinner than 17 to the inch for the 12-quart size and 20 to the inch for the 4 and 2 quart sizes, and if the parts were well nailed, these baskets were found to meet all heavy carloading requirements.

Baskets made with wooden handles were more rigid and made a tighter load than those with wire handles. The investigations showed that the covers should completely cover the top and should be well fastened so that they can not slide. The high raised covers used on

Climax baskets from Michigan and other sections resulted in heavy breakage. The ordinary flat wooden covers proved satisfactory when securely stapled to the ends of the baskets.

When made with ordinary care and uniformity, any of the grape trays in common use were found to hold up under heavy load conditions, as herein recommended.

HEAVY LOADING OF CARS.

The greatest difficulty in shipping the 1917 grape crop was in meeting the heavier loading requirements brought about by the war emergency conditions without undue crushing of the bottom packages. The interests of all are served by shipping carloads of the heaviest weight possible without undue injury to the contents. Every pound over the "minimum" which the railroad tariffs have established means a saving to shipper and carrier, provided the load is not injured thereby.

In the investigations it was found that certain shippers were consistently loading shipments of grapes which, regardless of package, car, railroad, or destination, arrived with little or no loss from breakage. On the other hand, cars from other shippers were just as consistently arriving in an unsatisfactory condition. A comparison of the cars shipped by the two classes of shippers showed that, within reasonable limits, the height of load had little influence on the amount of crushing. In fact, the shippers whose cars arrived in the best condition averaged more grapes to the car than did the others.

SHIFTING OF THE LOAD IN TRANSIT.

When the cars were opened in the market it was found that, while considerable breakage occurred at the ends, the greatest damage was at the floor near the doorway. Furthermore, the crushing was always much worse on one side of the car than on the other, owing to the shifting of the load toward that side. (Cover illustration and figs. 6 and 7.) Nearly every load examined had shifted so badly that near the doorways the top baskets were from 1 inch to 3 feet from one of the side walls (Figs. 8, 9, and 10.) The greater this shifting, the greater was the crushing at the bottom on the side toward which the shift came. The investigation finally disclosed the facts that *without exception*, the load was shifted toward that side of the car which was loaded last. This could only mean that the method of loading influenced the carrying qualities of the load.

METHODS OF LOADING.

The exact methods of loading practiced by the successful shippers were then carefully studied in order to compare their systems with those of the less successful shippers.

"STRAIGHT" SYSTEM OF LOADING CARS OF GRAPES.

The most successful shippers invariably used the most care in loading the packages into the car. They made the load tight by placing each package snugly against its neighbors (figs. 11 and 12). When using Climax baskets, especially of the 12-quart size, they followed the "straight" system of loading; that is, the first row of baskets ran the full length of the car from one ice bunker to the other (fig. 13). The succeeding layers and rows were then placed in the same way with the baskets of each layer fitting between the handles of those below. No baskets were placed crosswise of the car anywhere in the load except where necessary to fill out the otherwise vacant places at the ends of the load (fig. 14). Special care was used to see that each row was tight against the one preceding it.

When the last row was reached, the baskets were loaded diagonally with the baskets in each layer parallel with one another, and placed at an angle great enough to take up all surplus space (figs. 15 and 16.) By loading the last row in this manner the space was firmly filled and the handles acted as braces for the baskets above (fig. 17). In starting this diagonal row it was, of course, necessary at one end to "nose" the first basket into the corner of the car and at the other to place the first one crosswise in order to permit a good union when the last baskets were put in at the doorway. In exceptional cases, when the car width was such that the last row fitted snugly without placing the baskets diagonally, it was customary to place them in the same manner as they had been placed in the other rows (fig. 18).

It made comparatively little difference whether the 12-quart Climax baskets were loaded five high or seven high, so long as the baskets were placed exactly as has been described.

BASKETS PLACED CROSSWISE IN THE CAR.

Even one or two baskets placed crosswise in the car (fig. 19), *especially if near the floor*, created a weak spot around which there was often crushing. If the load "chucked" somewhat from one end, these occasional crosswise baskets were centers for breakage (fig. 20). The reason for this, it became apparent, was that crosswise baskets do not permit any "give" in the load. When a car is switched it is sure to receive a jolt; and, although the blow may be comparatively light, the load must give enough to take up the shock. Even when loaded as tightly as possible, Climax baskets are bound to give somewhat more than most fruit packages. The best that can be done is to load the baskets so that this "giving" will do the least harm possible. In decreasing losses from this source, the "straight" system of loading is far superior to the "square" system or to any other system or variation. It produces a unity of each row that is essential. Anything that tends to break that unity is a bid for damage.

"SQUARE" SYSTEMS OF LOADING CARS OF GRAPES.

Systems of loading Climax grape baskets known as the "square" systems are customary in certain sections (fig. 21). These systems consist in building the baskets up in stacks with half of the baskets lengthwise and half of them crosswise of the car. In the case of the 12-quart Climax basket these methods of loading cars nearly always resulted in considerable damage, and, while not so objectionable when used with the 4-quart, and especially the 2-quart basket, are not to be recommended.

COMBINING THE "STRAIGHT" AND "SQUARE" SYSTEMS OF LOADING.

Another common method of loading Climax baskets consisted of loading them in the cars as described under the "straight" system until the last two or four rows were reached. Then the load was completed by the "square" system (fig. 22). This combination method of loading was responsible for serious losses. (See cover and fig. 23.) It did not take up the surplus space from side to side of the car, and consequently the loads shifted badly. Then, too, as elsewhere stated, crosswise baskets are a continual source of weakness.

RACKS AT ENDS OF CAR.

It should be emphasized that it is necessary to load packages tightly together lengthwise of the car as well as sidewise. When cars were loaded by the "straight" system with all packages placed snugly there was comparatively little danger of having the load "chuck" severely when the cars were being switched. In cars where snug loading left a space at one end too small to take another package it was advisable to fill it in with wooden car racks (fig. 24).

MIXED LOADS.

One of the greatest single sources of damage was the practice of loading cars with different kinds of packages (fig. 25). Several cars for one firm were shipped with disastrous result from the Finger Lake section of New York in which the only "system" used was that trays should not be loaded on top of baskets. It was not unusual for a single car to contain trays, boxes, bushel baskets, and 12-quart baskets.

When it is absolutely necessary to ship "mixed" loads in order to assemble a full car, the one rule is to make completed rows of each kind of package from end to end of the car (fig. 26). Never, for example, should bushel baskets be placed in one end of the car, trays in the other, and Climax baskets in the middle. If these packages must be placed in one car the trays should form rows from end to end, followed by rows of the other packages. If there is not enough of one kind of packages to complete a row to the proper

height they should be loaded from end to end of the car, with the last row as high as the available number of packages will extend and another kind of package should be loaded above. It is even better to ship packages only in such numbers that it is possible to load them in complete rows to the full height.

CAR BULKHEADS.

More crushing occurred in open-bulkhead refrigerator cars than when the solid-bulkhead type, in which the bars are replaced by a solid wall, were used. When the car construction was such that any package or packages could work in under the bulkhead through the lower-bulkhead opening a narrow strip of wood was nailed across even with the "climax" or band at the top of these baskets, preventing many losses. It is well, however, to remember that the wider this strip the more the refrigeration of the load will be retarded. A 1½-inch board properly placed will serve as well as a 6-inch board and blocks only one-fourth as much circulation from the ice bunkers.

CAR FLOORS.

Still another point of interest is that cars so constructed that packages could not catch on the floor had fewer crushed and broken baskets than those with widely spaced floor strips running across the car, or with floor strips extending from the ice bunkers to a line even with the door studding and a smooth floor in the middle (fig. 27). It was surprising how many baskets were crushed because the bottoms caught on these floor strips and could not move a fraction of an inch with the rest of the load when the cars were jolted (fig. 28).

Ready to Load in Car for Shipment to Market.

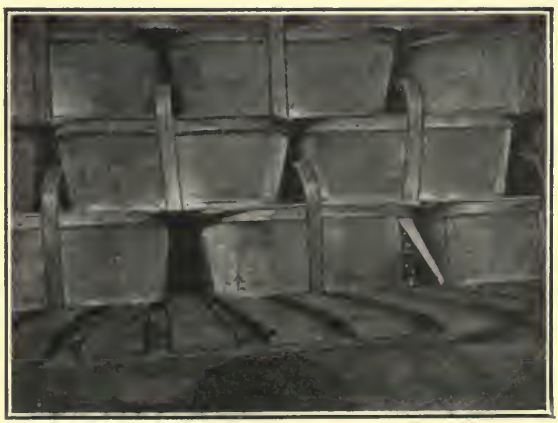
FIG. 1.—Grapes in 12-quart (Jumbo) Climax baskets ready for loading. Northeast, Pa., Oct., 1917.

At Market.

FIG. 2.—Unloading cars of grapes in a market city. Pittsburgh, Pa.

Buying Grapes for Wine.

FIG. 3.—Every basket is critically examined before being accepted. Boston, Mass., Oct., 1917.



How Some of the Damage Begins.

FIG. 4.—The basket at the bottom of the load is already beginning to crush before the car is completely loaded. When this basket gives way, the added weight on the neighboring baskets will crush them. One small defect is often the starting point for much damage. Westfield, N. Y., Oct., 1917.

Well-Loaded Grape Trays.

FIG. 5.—The above method of loading trays is an exception to the rule to load with no packages crosswise of car. But even this method is inferior to a tight, evenly loaded car with all trays endwise and the slack taken up by strong racks at the end or middle. Northeast, Pa., Oct., 1917.

Slack Loading Did This.

FIG. 6.—The bottom baskets on the side toward which the shift came are completely crushed. Boston, Mass., Oct., 1917.

A Few Baskets Loaded Crosswise of the Car Caused this Breakage.

FIG. 7.—Surplus space in the car was not taken up, with the result that the load shifted badly. Occasional baskets placed crosswise of car and too much space between ends of baskets aided crushing. Boston, Mass., Oct., 1917.

Load Shifted Because of Slack at Other Side of Car.

FIG. 8.—Shifting as it appears when cars are opened in the market. Boston, Mass., Oct. 1917.

Slack Loading Permitted This.

FIG. 9.—Bad shifting caused by leaving surplus space between rows on last loaded side of car (at right). Boston, Mass., Oct., 1917.

This Very Common Sight was Caused by Slack Loading.

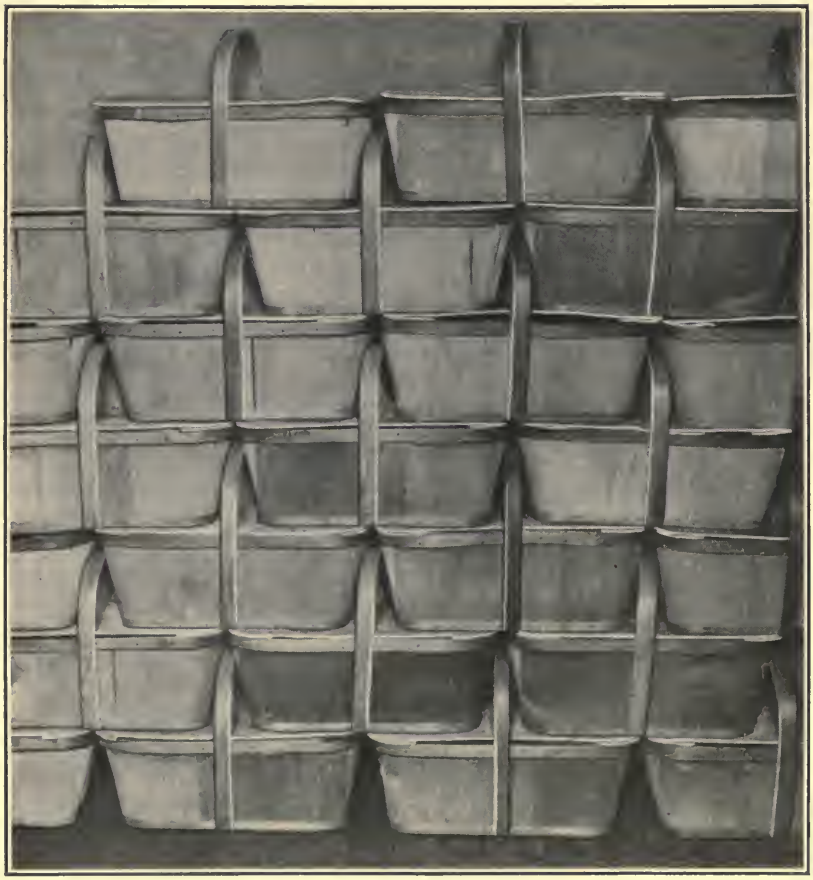
FIG. 10.—Shifting permitted by not loading with a view toward taking up all surplus space from side to side of car. This car is loaded only six high of the 12-quart baskets, yet is as badly shifted as loads seven and eight high. The baskets on the floor of this car on the side toward which this shift came were badly crushed. Boston, Mass., Oct., 1917.

Loose Loads Usually "Chuck," Causing Damage.

FIG. 11.—Note the surplus space between baskets. Such loads encourage severe "chucking," and consequent damage. The surplus space should have been taken up by use of a rack at one bulkhead. Oct., 1917.

A Careless Load Such as This is Unpardonable.

FIG. 12.—Can such a load be expected to carry well? The shipper twice reloaded the middle of this car when he noticed the Government representative making photographs. Northeast, Pa., Oct., 1917.



"Straight" System of Loading.

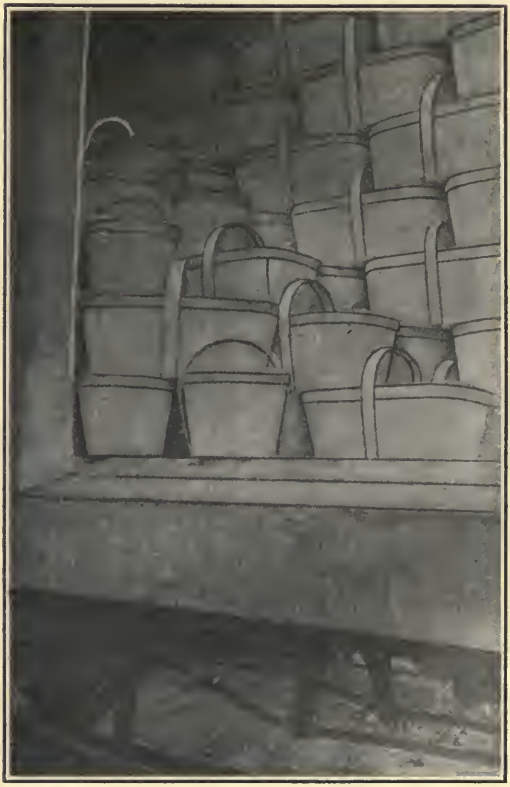
FIG. 13.—The baskets are well placed and there is no surplus space between them.

Good Snug Loading.

FIG. 14.—The only place that baskets should be placed crosswise of the car is next to the bulkhead to fill in the otherwise vacant spaces.

Details of a Row Loaded Diagonally.

FIG. 15.—The last row in the car should be loaded diagonally to take up any surplus space from side to side of the car.



The Last Row Loaded Diagonally as it Appears from the Car Door.

FIG. 16.—All slack from side to side of the car is taken up and the source of greatest crushing is thereby eliminated. Westfield, N. Y., Oct., 1917.

No Breakage in This Car.

FIG. 17.—This load arrived in perfect condition. Note the diagonally loaded baskets in the row next to the door. The other nine rows were all loaded by the "straight" system. Boston, Mass., Oct., 1917.

Car of Exact Width to Make Snug Load Without Placing Last Row Diagonally.

FIG. 18.—An exceptional case in which the last (tenth) row of baskets completely filled the space from side to side of the car, for which reason it was not necessary to place the last row diagonally. Westfield, N. Y., Oct., 1917.

A Poorly Loaded Car.

FIG. 19.—Occasional baskets placed crosswise of the load form centers around which breakage develops. This car is also loosely loaded. Westfield, N. Y., Oct., 1917.

Crosswise Baskets Caused This Breakage.

FIG. 20.—The layers of baskets placed crosswise of the car have given way and are more or less crushed, while the baskets placed endwise held. Crosswise packages are a continual source of damage and should not be permitted. Boston, Mass., Oct., 1917.

Unsatisfactory Loading Methods.

FIG. 21.—Two different "square" systems of loading Climax baskets. Neither of these should be used for the 12-quart basket, but they are quite satisfactory for 4 and 2 quart baskets if the loading is carefully done. The "straight" system, however, is preferred.

Loose Loads Like This Shift Badly in Transit and Cause Bad Breakage.

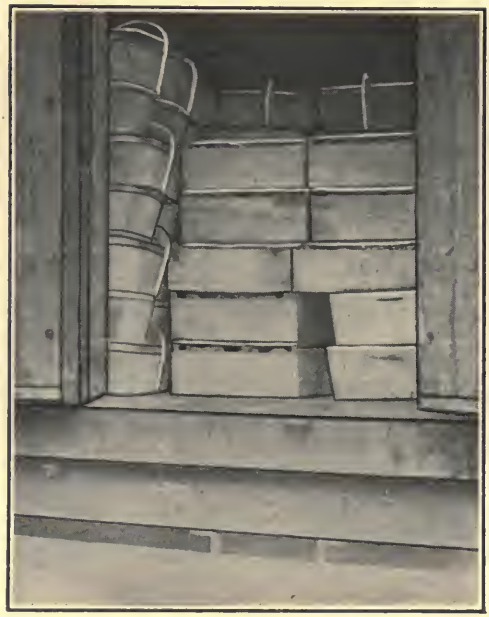
FIG. 22.—The last four rows are loaded by "square" system. Note the surplus space between baskets. This load will shift badly toward the right, and the bottom baskets will be crushed. Westfield, N. Y., Oct., 1917.

How a Car Loaded Like the One in Figure 22 Looked When Being Unloaded.

FIG. 23.—The picture tells the whole story. The side at the left was the first side loaded. All of the baskets in the first six rows were placed properly. In the last four rows they were loaded by the "square" system, which method did not take up all the surplus space. Consequently, the load shifted toward that side. Note that the bottom basket in the last fully visible row to the left is only partly crushed, the bottom basket to right thereof is in a considerably worse condition, and from there on the amount of damage increased rapidly until at the door on the right the bottom layers were useless. The pile on the right shows but a small part of the damaged baskets set aside when the half of the load where the camera man stood had been taken from the car. Boston, Mass., Oct., 1917.

Racks Take up Surplus Space at End of Car and Prevent "Chucking."

FIG. 24.—Rack used to occupy surplus space between baskets and bulkhead. Westfield, N. Y., Oct., 1917.

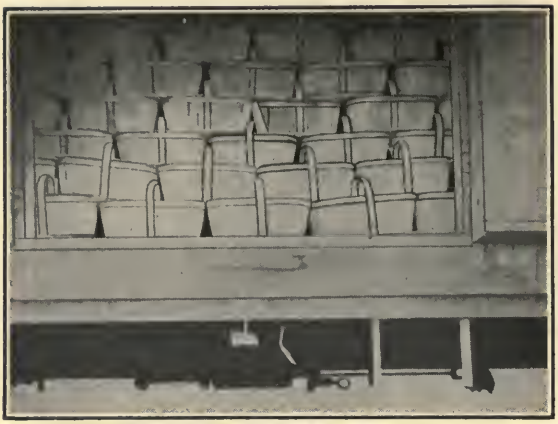


Such Loads Become Badly Broken in Transit.

FIG. 25.—With different kinds of packages in opposite ends of the load, crushing is almost certain to result. Northeast, Pa., Oct., 1917.

Very Little Breakage in Cars of Mixed Packages Loaded This Way.

FIG. 26.—When it is absolutely necessary to load more than one kind of package in a car, the above method should be used with complete rows (only) of each kind of package, from end to end of car. Westfield, N. Y., Oct., 1917.



An Uneven Floor Makes a Poor Load.

FIG. 27.—Car-floor strips often extend only from bulkheads to door studding, resulting in unevenness of floor and often a crushing of baskets when the load "chucks" and bottom board of the baskets catch on ends of floor strips. Westfield, N. Y., Oct., 1917.

Breakage When Packages Catch on Car Floor.

FIG. 28.—The bottom baskets caught on the floor strips running crosswise of the car, and when the load "chucked" in switching these baskets were crushed. Note the light load in this car. Boston, Mass., Oct., 1917.

Are Hampers Satisfactory?

FIG. 29.—Hampers are, at best, unsatisfactory packages for shipping grapes. Boston, Mass., Oct., 1917.

Loading to Make a Snug Load from Side to Side of Car.

(In figs. 30 a to c the baskets in the row nearest to the reader were not moved.)

The "Square" System Does not Take up Full Space.

FIG. 30a.—Note that there are 4 inches of space between the car wall and the edge of the first basket.

The "Square" System does not Take up Full Space.

FIG. 30b.—Note that there is no improvement by the use of the "square" system for the last two rows. There are still the 4 inches of surplus space.

The "Diagonal" System for the Last Row Does Take up all Surplus Space from Side to Side of car.

FIG. 30c.—Note that the "diagonal" system for the row next to the car wall takes up all surplus space. A carefully loaded car with the load stowed in this way can not shift in transit.